

REPRODUCTION FACTOR STUDY

Current Notes

May 9-10 (NRP South) Several holes dug by rodents about 1" deep on beds 34 and 35; probably responsible for at least part of losses.

One hole on bed 7. Cardboard nearly chewed up, as by porcupine. Two seedlings classed as "unkown" death (bed 17) were "albinos" since out of ground -- yellow and never colored up; eventually wilted and died, top slightly scorched appearance, but doubtful if heat primary cause of death.

One seedling dead in bed 6 (NRP South), litter-covered, showed shrivelling of stem about 1/8 inch long just below needles; another in same bed showed two such spots; needles dried in both cases, but remainder of stem and root OK. Possibility of early mechanical injury as bird pecking or crushing, but doubtful; heat also possibility.

May 11 (as of May 10) In bed 36 (rodent work abundant nearby) the 13 "unknown" losses may be largely rodents but the seedlings had entirely disappeared. Could call "other biotic" perhaps.

One dead in small bed # 1 (litter covered) classed as "withered" blue. Stem and root looked OK but leaves wilted. No sign of any mechanical injury. Seedling (including root) about 5" long. (Rodent proof).

Bed #6 in Rodent proof -- 1 dead white classed as "withered." Root and stem appeared to be healthy and no sign of mechanical injury but stem and leaves were dried up. Both were small seedlings. One dead in bed #3 Rodent proof classed as "withered" blue. Small seedling with stem and leaves dried up. No mechanical injury to stem but leaves were cut off probably by birds down to 1/4" from stem. I don't think this was cause of death, however.

Flat Enclosure -- Rodent Proof; Most of "white staked" seedlings in Beds 2 and 7 were partly bird nipped when staked; if none recover, charge loss to first period.

All enclosures: On large beds up to and including May 12, there was no check on current losses of current period seedlings which had been destroyed before being checked. Beginning May 13 an attempt was made to record such, in view of continuing heavy rodent and bird losses. When stubs of seedlings were thus found without stakes, they were tallied both as "new" and as killed by rodents or birds (or other) on given date.

May 12

Bed 11 South, Non-Rodent Proof: Two small rodent holes 2-3" in diameter, each along side a seedling. No visible damage was found in the bed.

Bed 17 South, Non-Rodent: One healthy looking seedling (blue) appeared to have stem cut off close to root and pulled down so that the leaves were flush with the ground. Probably rodent injury.

May 15

Heat kill in litter beds was chiefly of young seedlings with needles not yet out of litter--needles and sometimes upper end of stem dried up. Can not see seedlings when in stage of crook barely out of soil; hence these classed as "old" seedlings heat killed; really relatively young. One in small Bed #1, South RP, however was distinct stem girdle type of kill.

Very heavy bird losses noted on Beds 8 and 1 (seed hulls and seedling remnants) NRP. Chirping sparrows abundant.

May 16

Rodent hole about 4" deep and 5" diameter in Bed 34 Non-Rodent Proof north. No damage done.

May 20

Flat NRP. Part of "heat" kill of "seeds" noted for bed 27 may be frost. Seedlings are freshly wilted, with a somewhat bruised appearance of the needles. Same condition on other beds of Flat, but in most cases seedlings staked as living. If many die per records next time, could probably ascribe to this cause.

May 20

Large ground squirrel hole in upper center of Bed #1, 3" diameter, to unknown depth. Excavated dirt over $\frac{1}{4}$ of bed. Nearly all seedlings had been destroyed.

May 18

Removed shade frames from all beds in evening; looks like rain.

May 22

After three days of intermittent clouds and sunshine, with light showers (total .03"), bright and clear this morning. Watered all L and H large beds, six gallon to bed, about equal to .2" rain. Some of value lost by sunshine on beds at time. Replaced shade frames after watering. Began with three men on South enclosure, 8:15 to 11:45 A.M., including refill time. Had to carry all from can below enclosure. Watered North enclosure, using hose for supply, two men 11:45 to 12:15; 1:15 to 2:15; three men 2:15 to 3:30; four men 3:30 to 5:00. Watered Flat, three men 6:30 to 8:30 P.M.--incomplete. Giving small beds two quarts, equal to .2" precipitation.

May 23

Completed watering: Two men 8:00 A.M. to 10:15 A.M.--Flat NRP and small beds on part of North and all of South. Total man hours for watering, 34. Replaced shade frames immediately after watering.

May 23

Completed placing of shade frames--three beds on NRP and all (18) on North NRP. Also #32 Flat, NRP, which had previously been overlooked.

May 24

Read and Danielson all day on examination of North RP plots and small beds, all enclosures. Still many new seedlings on North littered beds. Mowat assisted $2\frac{1}{2}$ hours. Placed hygrothermograph in shelter at Flat station.

May 29

Watered all "H" large beds, eight gallon of water (equal to about .27" precipitation); and all small beds, two quarts each. Mostly in evening, so soil gained full advantage of it. Some difficulty in preventing run off on certain bare beds, especially on North, with this quantity of water applied rapidly; had to water some in several installments.

May 31

5:00 P.M.--Removed shade frames. Partial interception of last night's shower.

June 3

A.M. Replaced shade frames.

June 6

South RP Bed 36 Removed lw, lr, dead from cause unknown. White had roots to 10" depth. No specific injury. General death; only turgid part was near root top. Top looked like drought death. Several others during this period appeared similar--probably some charged to heat, some to damping off, some to unknown, according to location and other evidence.

June 6

Removed shade frames 5:00 P.M. during rain. Frames were on during shower of last night (.06") and beginning of storm this afternoon, but interception was probably not material. Probably half of rain goes through cloth in fine spray.

June 8

Replaced shade frames 9:00 A.M. Heavy rains of June 6-7 have soaked soil and made slight interception mentioned above immaterial.

June 19

Bed #4, North NRP -- Four "P" and one "Or" seedlings of those noted as killed by fungi (damping) (off) were still in the "crook stage", not fully out of the ground. Many of these late germinating seedlings have seemed to cease growth just at this stage, though remaining green and turgid for a week or two; then rather rapidly shrivel and dry up, with little evidence of causative agent. A few dug out before complete drying showed rotting of the cotyledons and some rotting of the stem, and often a drying or rotting root. The "crook" portion is about the last to shrivel. While there are other possibilities, such as lack of vigor to pull out due to small seed or too deep planting, and the "scorching" of the crook by sun heat mentioned earlier in the season, damping off seems the most probable cause of these losses during the recent cool period and especially in shaded beds. In certain beds, especially on the Flat, the hard baked surface of the soil inhibits the normal withdrawal of the cotyledons, and may in some cases thus be the primary factor.

June 22

In examination of bare beds on South RP enclosure today, several dead seedlings had apparently been dead for some time and hence most

of them are credited to the June 11-20 period rather than the 21-30. Several seedlings were marked on June 17 as showing very slight wilting ascribable to damping off. Most of these died within the next few days. Hence it is not unreasonable to still be indicating damping off as a death cause, though it may be as much as two weeks after the attack. These older seedlings often maintain their turgidity and apparent health many days after injury or disease of root or lower stem.

June 30

Flat RP Several deaths ascribed to "fungi", as in Bed 34 and elsewhere, failed to show the flabby or papery lower stem usually characteristic of same, showed no heat lesions (in shaded bed); if really damping off, must be lower root rot, as roots quite dead. Top looks like drought wilt but soil moist beneath surface 2".

E. L. Mowat

Ass't Silviculturist



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